THE FAMILIES OF SYNENTOGNATHOUS FISHES AND THEIR NOMENCLATURE.

By Theodore Gill, LL.D.

In 1872 I recognized two families of Synentognathous fishes and designated them as Belonidæ and Scomberesocidæ, establishing the former for Belone as generally understood,[1] and restricting the latter to the Exocœtinæ, Hemirhamphinæ and Scomberesocinæ types.[2]

The constituents were thus indicated, but the families themselves were not defined. To complete this delayed task, as well as to present the opinion of others, is the object of the present communication.

I.

The genus *Esox* was adopted by Linnæus from Artedi, and its cardinal character was the backward position of the dorsal and anal fins, and their opposition to each other. The other points noted were secondary and sometimes ignored in practice. The artificial character of the genus will be evident from a consideration of the species referred to it in the last edition of the Systema Naturæ.[3]

Species of the Linnæan genus Esox.

Linnæan species.	Modern genera to which referred.
1. *Sphyræna*	*Sphyræna*
2. *osseus*	*Lepisosteus.*
3. *Vulpes*	*Albula.*
4. *Synodus*	*Synodus.*
5. *Lucius*	*Lucius* (= *Esox*, Cuvier).
6. *Belone*	*Esox* (= *Belone*, Cuvier).
7. *Hepsetus**	
8 *brasiliensis*	*Hemirhamphus.*
9 *gymnocephalus*†	*Chirocentrus?*

* The *Esox hepsetus* of Linnæus was a compound of very dissimilar forms. In the tenth edition of the Systema Naturæ its synonyms are (1) the "Argentina pinna dorsali pinnæ ani opposita" of the Amœnitates Academicæ (I, p. 321, 1749), and (2) the Piquitinga of Marcgrave. The former is unrecognizable, but Cuvier and Valenciennes felt sure that it was not a *Hemirhamphus*. It had numerous teeth (os interne denticulis exasperatum), the lower jaw slightest produced (maxilla inferior paullo longior), a double lateral line (duplici linea longitudinali a lateribus distinctum), and the rays: B. approximately 10 (cerciter decem), D. 14, P. 12, V. 6, A. 15, C. 14.

†The *Esox gymnocephalus* is another of the undeterminable species of Linnæus. Cuvier and Valenciennes thought that it might have been an *Erythrinus*, but such could not have been the case, as the radial formula (D. 13, P. 10, V. 7, A. 26, C. 19) clearly shows, even assuming that Linnæus had erred as to its habitat ("in India"). It essentially agrees with the *Chirocentrus dentex*, and was quite likely a young specimen of that species ("Magnitudine *Ammodytis* erat qui nobis visus").

[1] Günther, Cat. Fish. Brit. Mus., VI, pp. 234–256.

[2] Günther, op. cit., pp. 256–298.

[3] Vol. I, p p. 515–517.

This strange medley (rendered more heterogeneous still by some succeeding authors) was allowed to remain for a number of years. At length, in or before 1803, *Sphyræna*, *Lepisosteus*, *Albula* and *Synodus* were eliminated, but not until 1810 was the residuum disintegrated.

II.

In 1810 Rafinesque, in his "Caratteri," divided the genus *Esox* as left by Lacépède in the following terms:

Il genere Esox di Linneo è stato diviso da Lacépède in quattro generi, *Esox*, *Sphyræna*, *Synodus* e *Lepisosteus;* io propongo di dividere nouvamente in due il suo genere *Esox;* lascierò questo nome alle specie marine che hanno il corpo tetragono con due linee laterali da ogni lato como nil genere *Exocætus*, le mascelle lunghe e strette, le ale dorsale lunghe giungendo dall' ano fino alla coda e falciformi, &c.; mentre formerò un nuovo genere col nome di *Lucius* della specie fluviatile che hanno il corpo cilindrico, una sola linea laterale, le mascelle larghe, e le ale dorsali ed anali corte e rotondato.

This division was quite good, and the distinction of the two genera justified by the contrasted characters as well as the names. Rafinesque has still further the merit of recognizing a similarity between *Esox* as limited by him (*Belone*) and *Exocætus*. But the proposition thus regularly formulated was destined to remain long in abeyance and the names given to be superseded by a later set.

III.

In 1817 Cuvier, in the "Règne Animal," divided *Esox* on the same lines as Rafinesque had done, but restricted *Esox*[1] to the pikes (*Lucius*, Rafinesque) and gave the name *Belone*[2] to the garfishes (*Esox*, Rafinesque). This view has been almost universally accepted, the only dissenters being Bonaparte in 1850, and very recently Jordan, with a few other American naturalists.[3] The reversion of those naturalists to the Rafinesquian names is perfectly justified. Even the perversion of ancient names is less under such usage than under the Cuvieran nomenclature. As this statement may surprise some, a justification of it is timely, especially as it may tend to quiet those whose minds would be otherwise too much disturbed.

IV.

Esox is a name so long connected with the pike in scientific nomenclature, that it is probable that even many ichthyologists suppose it to be the ancient name of that fish. There is, however, no reason to suppose that it was its proper name; on the contrary, there is every reason to believe it had nothing to do with the pike. The only occurrence of the word *Esox* (or *Isox*) or *Esos* in ancient classical literature, so far as

[1] Règne Animal, II, p. 183.

[2] Règne Animal, II, p. 185.

[3] Bleeker has revived the name *Mastacembelus* of Klein for the garfishes.

preserved or known, is in a single passage of Pliny's Natural History[1]. According to Pliny, the *Esox* or *Esos* was a very large fish of the Rhine, equaling the tunny in size, that is, weighing about 1,200 pounds, and which might require a yoke of oxen to haul it out.[2]

Gesner imagined this notice to be referable to the pike, and he appears to have been the originator of the misconception, which, however, was not shared by his contemporaries or many of his successors. There is, indeed, good ground to believe that the name used by Pliny was a corruption of some German or Gallic designation of the sturgeon.

V.

Belone is generally connected with the gars, and by later lexicographers, as Liddell, Scott, and Drisler (1883), defined as "a sharp-nosed kind of fish, garfish, elsewhere *ῥαφίς*." This is, however, at most only partially true. The notices of Aristotle clearly indicate that in most cases a syngnathid or pipefish was the form intended; such as the statements that the belone, in the period of reproduction, splits apart and thus allows the eggs to escape, having a slit under the stomach and intestine which, when the eggs are discharged, heals up (VI, 11, 2);[3] and also that the belone is late in parturition and then burst, and that the young attach themselves to the parent (Aristotle, VI, 16, 4). The statement that the kingfisher's nest is principally composed of backbones of the belone[4] is also significant.

The point in the statement that the halcyon makes its nest of the belone's bones relates to the size of the fish. The gar is a comparatively large fish, and not likely to have been used in such connection. Nor is it obvious how the bones were identified as the belone's,[5] and it is probable that the allegation involves a generalization based on an extremely limited number of observations of nests in which dried pipefishes or their exoskeletons may have been found. It should not be forgotten, either, that the kingfisher scarcely makes a nest deliberately of fish bones. According to Seebohm,[6]

> The kingfisher does not make any more nest than that which the ejected fish bones supply. * * * Upon this nest of fish bones, if nest it can be properly called, the

[1] Book IX, chap. 17 (15).

[2] Præcipua magnitudine thynni: invenimus talenta XV pependisse. Ejusdem caudæ latitudinem duo [quinque] cubita et palmum. Sunt et in quibusdam amnibus haud minores: Silurus in Nilo; Esox in Rheno; Attilus in Pado, inertia pinguescens, ad mille aliquando libras, catenato captus hamo, nec nisi bovum jugis extractus. (Pliny, IX, cap. 17 (15).)

[3] *Οἱ μὲν οὖν ἄλλοι ἰχθύες γόνω τικτουσί καὶ τὰ ὠὰ ἀφιᾶσιν ἡν δὲ καλοῦσί τινες βελόνην, ὅταν ἤδη ὥρα ἡ τοῦ τίκτειν, διαῤῥήγνυνται, καὶ οὕτω τὰ ὠα εξέρχεται· ἔχει γάρ τινα ὁ ιχθὺς ουτος διαφυσιν ὑπὸ τὴν γαστερα καὶ τὸ ἠτρον, ὡσπερ οἱ τυφλίναι ὑόεις ὅσαν, δ'ἐκτέκη, συμφίεται ται τα πάλίν.*—Aristotle, *Περι τα ξωα ίστοριων* E (VI), cap. 13 (12).—I use the Paris edition of Didot (Opera, III, 1854).

[4] Aristotle, IX, 15.

[5] No reference is made anywhere to the green color characteristic of the bones of the gars.

[6] Hist. Brit. Birds, II, p. 344.

female kingfisher deposits her round, shining-white eggs, from six to eight or nine in number.

The European kingfisher is a small bird, with a length of wing of about 3 inches. Therefore it can not catch garfishes, although it can capture small pipefishes, living, as they do, in shallow, reedy waters.

Another ancient equivalent of *βελόνη* was *ἀβλεννής*,[1] and that name, signifying "without mucosity," would be especially applicable to the pipefish and not to the gar.

Still another synonym of *βελόνη* was *ῥαφίς*. The *Rhaphis*, according to Aristotle, was toothless, thus contrasting with the formidably toothed gar and agreeing with the edentulous pipefishes. The synonymy of *Rhaphis* with *Belone* was declared by Dorio, according to Athenæus,[2] who said that the *βελόνη* was the same fish they called *ῥαφίς*. The name is also still retained in composition in Greece, the *Siphostoma acus* being known in some places as Saccorapha (*σακκοράφα*), according to Apostolides.[3]

So far, then, as all the statements respecting *Belone* and its synonyms, *Rhaphis* and *Ablennes*, are specific, they are applicable to the pipefishes and not to the garfishes. But surely, it may be urged, the garfish must have been noticed by Aristotle or some of the ancient writers. It undoubtedly was, and one of the names that has not been identified indicated that fish.

Aristotle, in referring to those fishes which are gregarious, names the *Sarginos* (*Σαργῖνος*) just before the *Belone*.[4] This alone would show nothing and would cast no light on the special fish intended, but it so happens that very slight modifications of the same name (*σαργάνος*, *Ζαργάνα*) are still borne in Greece by the garfish, according to Erhard, Apostolides, and Hoffman. This fact, taken in connection with its habits and the juxtaposition of the name to *Belone*, as well as negative evidence, leaves little or no doubt that the *Sarginos*[5] of Aristotle was the garfish.

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[1] By a fortunate lapsus in transliteration, Dr. Jordan gave the name *Athlennes* (instead of *Ablennes*) to a subgenus of gars peculiar to America, and therefore only a meaningless name has resulted instead of the more objectionable perversion of an ancient one.

[2] Book VII, section 111.

[3] La Pêche en Grèce, p. 11.

[4] Aristotle, after distinguishing different kinds of gregariousness in fishes, collocates them as follows: *Ὅλως δ' ἀγελαῖά ἐστι τα τοιάδε, ὑννίδες, μαινίδες, κωβιοι, βῶκες, σαῖροι, κερακῖνοι, σινόδοντες, τρίγλαί, σφύραιναι, ἀνθίαι, ἐλεγῖνοι, ἀθερῖνόι, σαργῖνοι, βελόναι, τευθοὶ, ἰουλίδες, πηλαμύδες, σκόμβροι, κολίαι.*—IX, chap. 2 (3).

[5] *Sarginos*, it has been said, "seems to be A derivative of *σαργός*," but this etymology appears to me to be very improbable, and the similarity of the two names is probably a mere accidental coincidence. A strange identification has been attempted of the *Sarginos* with the *Tetragonurus cuvieri*, or, in the words of Cresswell (Aristotle's History of Animals, p. 321), "*Tetragonus niger*." (It may be added that the page referred to in Cresswell's index should be "234" instead of "231.") There is, of course, not the slightest justification for such an identification.

It is possible, too, although improbable, that in ancient times there may have been some confusion of the garfish with pipefishes, and that the former may have been considered as overgrown Belonides. It is still more possible, and even probable, that in the lapse of time such confusion had resulted and even culminated in the transfer of the name *Belone*, under the modified form *βελονίδα*, and to the garfish. Certain it is, at least, that Erhard and Apostolides[1] have given the last name as one now carried, as well as the others, by the garfish in Greece. It is proper to add, however, that their statement has not been confirmed by Professor Hoffman, who only heard *Zargana* applied to the garfish.

Apostolides himself[2] elsewhere uses only the name *Zargana*, as when he notices the fishes of passage[3] and those that are caught at certain seasons.[4]

It must be remembered also that the same name is not infrequently applied to animals differing greatly, because they have some superficial resemblance or adaptation. Thus, in Greece at the present day, the same name (*Chelidonopsaro*, *Χελιδονοψαρο*) is given to the flying fishes of the genera *Dactylopterus* and *Exocœtus*, although they differ greatly in almost every character and belong to different orders. The resemblance between a garfish and pipefish is at least as great as that between a dactylopterid and an exocœtid.

VI.

The synentognathous fishes were by most naturalists retained in the same family with the pikes from 1817 to 1845, when Müller segregated them as a peculiar family under the name *Scomberesoces*. There were, however, several dissentients from this view, and partial anticipations of modern views. The most prominent idea—and an erroneous one—was that the modification for emergence from the sea and sustentation in the air was of superior systematic value. On this assumption the flying fishes, or Exocœtines, were differentiated from all the other Synentognaths.

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[1] An analogous case of confusion and subsequent transfer of name by the modern Greeks to a quite different fish from that called by the same designation among the ancient Greeks, is furnished by *Scarus*. The *Scarus* (*Σκαρος*) of Aristotle was unquestionably the fish which still bears that name (or *Sparisoma scarus*) in ichthyological literature, but according to both Apostolides and Hoffman the title is now applied by some fishermen at least to a *Sargus* (*Diplodus vetula*). Even the name, as an independent species, of the fish so renowned and prized among the ancients (Nunc Scaro datur *principatus* [etc.], Pliny, IX, ch. 29), does not appear in the memoirs of either Apostolides or Hoffman and Jordan.

[2] La Pêche en Grèce, p. 32 (1883).

[3] Les pêcheurs distingnent bien les poissons qui, pendant toute l'année, ne quittent pas les côtes, et ceux qui y apparaissent à des époques déterminées. Ces derniers reçoivent le nom de passagers (*περαστικά*), tels sont les différentes espèces de Sardines, les Maquereaux, les Scombres maquereaux (*κολιοί*), les Saurels (*Σαυρίδια*), les Thons (*Μαγιάτικο*, poisson de mai), les Pelamydes et, dans certains endroits, les Bélones (*Ζαργάναί*).—La Pêche en Grèce, p. 36.

[4] Dans ce même mois [Septembre] se fait aussi la pêche des Bélones (*Ζαργάνες*), [etc.].—La Pêche en Grèce, p. 38.

VII.

As early as 1850, Prince Bonaparte of Canino had used the names *Belonidæ* and *Exocætidæ*. In his "Conspectus Systematis Piscium," he proposed the following division of the Esoces or Synentognathi:

SECTION VI. PHARYNGOGNATHI.

ORDO 14. *Esoces.*

68. Belonidae.				
160. Belonini.....	6[1]	5	Med. Atl. Pac.....	80
69. Exocœtidae.				
161. Exocœtini.....	..	2[2]	Med. Atl. Pac.....	40
	6	7		120[3]

It will be evident to one familiar with the status of ichthyology in 1850, that the families so named have quite different limits from those later recognized. In fact, they are simply the subfamilies "Belonini" and "Exocetini" of Bonaparte's earlier systems, elevated to family rank. The Belonini were those with the pectorals normal (pinnæ pectorales congruæ) and jaws produced (mandibulæ longissimæ, in rostrum acutum protractum); they thus included not only Belonidæ as properly limited, but also Scomberesocinæ and Hemirhamphinæ. The Exocœtini were defined solely in the following terms: "Exocetini. Pinnæ pectorales maximæ, volatui aptæ."

As Bonaparte had, in the same "Conspectus," used the name *Luciidæ* in place of *Esocidæ* for the pikes, it is almost certain that he had been influenced by his knowledge of Rafinesque's work, and had adopted the names given by him.

VIII.

In 1872 Gill, in his "Arrangement of the Families of Fishes," divided the Synentognaths into two families.

Order SYNENTOGNATHI.

139. *Belonidæ* Scomberesocidæ, Gthr., VI, 233, 234–256.
140. *Scomberesocidæ* Scomberesocidæ, Gthr., VI, 233, 256–298.

By these references, the family Belonidæ was limited to the genus *Belone*, as recognized by Günther, and Scomberesocidæ to the genera *Scomberesox*, *Hemirhamphus*, *Arrhamphus* and *Exocœtus*, of the same author. Gill was led to this classification by a consideration of the relations of the intermaxillary and supramaxillary bones, and the development of the characteristic supplementary bone of the lower jaw.

[1] "Fossiles." [2] "Europ." [3] "Species viventes."

In 1878 Professor Cope[1] defined the *Belonidæ* in the following terms:

The genus *Belone* must be placed in a family group distinct from that which includes the genus *Exocœtus* and its allies. I have already pointed out the fact that it possesses a distinct coronoid bone; in addition to this, the vertebræ display zygapophyses, a character unusual among fishes. On these two characters I propose the family Belonidæ. Professor Gill has already created this name, but he did not define the group to which he applied it.

These views were not adopted for some time by other authors, Messrs. Jordan and Gilbert and others preferring the older compound.

In 1885 Dr. Jordan[2] accepted the two families, Belonidæ and Scomberesocidæ, although, by a typographical slip, all were placed under the former name, the latter having been forgotten.

In 1888 Dr. Jordan[3] reverted back to the old views, combining all the Synentognaths in one family designated as *Exocœtidæ*.

Other historical data may be obtained by reference to the synonymy of the various types.

IX.

The gars have a lower jaw peculiar in that, in addition to the normal three bones (articular, angular and dentary), a fourth is developed continuous from the articular and lying mostly inside of the upper portion of the dentary. This element appears to have been unnoticed by most naturalists and to have been first observed by Dr. B. C. Bruhl.

In 1847 Bruhl[4] published a figure of the disintegrated right mandible in which the supplementary bone is marked "ZK". I have, however, been unable to find any reference to it in the text. In his observations on the lower jaw,[5] Bruhl indeed stated (erroneously) that an excess over three bones was found only in two fishes, *Lepidosteus* and *Osteoglossum*.[6]

In 1878 Professor Cope[7] recalled that he had "already pointed out that [*Belone*] possesses a distinct coronoid bone", and considered the

[1] Synopsis of the Fishes of the Peruvian Amazon, etc. (Proc. Am. Phil. Soc., XVII, 695.)

[2] Catalogue of the Fishes of North America, p. 59.

[3] A Manual of the Vertebrate Animals of the Northern United States, fifth edition, p. 91.

[4] Anfangsgrunde der vergleichenden Anatomie aller Thierklassen, Atlas, pl. XI. fig. 17.

[5] § 39. Der Unterkiefer.

[6] Vermehrung der Unterkiefertheile findet sich wirklich nur bei zwei Fischen: bei Lepidosteus osseus und Osteoglossum (nach Müller), die sechs Stücke in jeder Unterkieferhälfte zählen. Bei Anarrhichas lupus befindet sich (nach Duvernoy's Angabe, c. l. Tom. IV, Part 1, pag. 20) die Gelenkfläche des Gelenkstückes an einem, vom übrigen Gelenkstücke getrennten Knöchelchen, das er subangulaire nennt. Das Vorkommen von vier Theilen in jeder Unterkieferhälfte bei Polypterus . . . bildet keine Ausnahme von der Normalzahl, [etc.].—Anfangsgrunde der vergleichenden Anatomie aller Thierklassen, p. 90.

[7] Proc. Am. Phil. Soc., XVII, 695.

possession of that element to be one of the two cardinal characters distinctive of the family Belonidæ.[1]

It is not in *Belone* alone, however, that the supplementary bone in question occurs. It is also to be found (but in diminished proportions) in the other Synentognaths. It was found quite independently by a disciple of Dr. Jordan. In a letter to me dated April 24, 1894, Dr. Jordan wrote:

> According to Mr. Stark, one of my students who is working out their skeletons, there is a rudiment of this so-called coronoid in all the Synentognaths as well as in *Esox* [= *Belone*].

Dr. Jordan has aptly called the element in question the "so-called coronoid".[2] It can not be called appropriately the coronoid, as that term implies homology with the bone so called in Lepidosteids, and between those fishes and the Belonids is an impassable gap and a host of intervening forms without any corresponding bone. The bone in question, therefore, must have been independently developed, and consequently should receive a distinctive name. *Addentary* may be taken as a somewhat descriptive designation

X.

In the present communication, I have preferred to adhere to my previous estimate of the Exocœtines, Scomberesocines, and Hemirhamphines, and have retained them as subfamilies. Dr. Jordan, however, has elevated them to family rank, and in a letter to me expressed the following sentiments:

> I am inclined to think that the flying-fishes and the half-beaks at least should be separated into distinct families, as the upper pharyngeals are fully united in the latter and separated in the flying-fishes and in *Scomberesox*. I am sure that differences of this grade would be accepted as family differences in large groups like the percoid fishes, and I do not see why they may not properly be so regarded here. There is, however, no doubt of the close union of these forms as compared with *Esox* [*Belone*].

Dr. Jordan's opinions are entitled to the utmost consideration, and it is quite possible that I may be convinced hereafter of the propriety of this enhanced valuation of the characteristics of the several groups in question. At present, however, it appears to me that the differences of the pharyngeals in certain groups recognized by both of us as natural families, are quite as great as those manifested in the forms still retained in the family of Exocœtids. Such are the Sciænids, the Pomacentrids, and the Labrids.

[1] I have been unable to learn, either through an examination of Professor Cope's works or through the author himself, where he had previously pointed out that [*Belone*] possesses a distinct coronoid bone. Professor Cope was unable to find any previous notice.

[2] The "coronoid" of ganoids can not be homogenetic with the homonymous bone of reptiles, and, as the name appears to have been originally used in connection with the crocodile, the ganoid's may be called "coronine."

XI.

Order SYNENTOGNATHI.

=*Pharyngognathi malacopterygii*, MÜLLER, Archiv Naturgesch., 9. Jahrg., I, p. 310, 1843; 16. Jahrg., I, p. 103, 1845; Abhandl. Akad. Wiss., 1842, p. 170. (Suborder.)

=*Esoces*, BONAPARTE, Consp. Syst. Piscium, Ordo 14, 1850. (Order.)

=Soft-finned Pharyngeal Fishes (*Malacopterygii*), ADAMS, Man. Nat. Hist., p. 106, 1854. (Suborder.)

=*Synpharyngodontes*, BLEEKER, Enum. Spec. Piscium Arch. Ind., p. xxx, 1859. (*Tribus* of Ordo *Esoces*.)

=*Synentognathi*, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 148 (1859). (Suborder.)

=*Malacopterygii pharyngognathi*, GÜNTHER, Cat. Fish. Brit. Mus., V, p. 1, 1865. (Suborder. Abandoned, and family *Scomberesocidæ* only recognized, VI, p. 233.)

=*Synentognathi*, COPE, Proc. Am. Assoc. Adv. Sci. 1871, XX, pp. 335, 338 (1872). (Order.)

=*Scombrésoces*, BLEEKER, Atlas Ich. Indes Néerland., VI, p. 40, 1866–72.

=*Synentognathi*, JORDAN and GILBERT, Syn. Fishes N. Am., pp. 367, 371, 1882. (Order.)

Family EXOCŒTIDÆ.

<*Siagonotes*, DUMÉRIL, Zool. Anal., p. 149, 1806.

×*Esocetini*, RAFINESQUE, Indice d'Ittiolog. Siciliana, p. 35, 1810.

>*Nairidini*, RAFINESQUE, Indice d'Ittiolog. Siciliana, p. 33, 1810.

<*Siagonia*, RAFINESQUE, Analyse Nat., p. 89, 1815.

<*Exocoides*, RISSO, Hist. Nat. de l'Europe Mérid., III, p. 440, 1826.

<*Scomberesoces*, MÜLLER, Archiv Naturgesch., 9. Jahrg., I, p. 312, 1843; 11. Jahrg., I, p. 102, 1845.

<*Scomber-Esoces* (*Scomberesocidæ*), AGASSIZ, Rept. Brit. Assn. Adv. Sci., 1844, p. 292.

>*Exocœtidæ*, BONAPARTE, Catalogo Metodica dei Pesci Europei, pp. 8, 80, 1846.

>*Exocœtidæ*, BONAPARTE, Consp. Syst. Ich., fam. 69, 1850.

×*Belonidæ*, BONAPARTE, Consp. Syst. Ich , fam. 68, 1850.

<*Scomberesocidæ*, ADAMS, Man. Nat. Hist., p. 106, 1854.

<*Scomberesocidæ*, RICHARDSON, Encycl. Brit., 8 ed., XII, p. 264, 1856.

<*Scombresocoidei*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxx, 1859.

×*Scomberesocoidæ*, GILL, Cat. Fishes E. Coast N. America, p. 38, 1861.

>*Exocœtoidæ*, GILL, Cat. Fishes E. Coast N. America, p. 38, 1861.

<*Scombresocidæ*, GÜNTHER, Cat. Fish. Brit. Mus., VI, p. 233, 1866.

<*Scombresocidæ*, COPE, Proc. Am. Assoc. Adv. Sci., XX, p. 338, 1872.

=*Scomberesocida*, GILL, Arrang. Fam. Fishes, p. 11, 1872.

<*Scomberesoces*, FITZINGER, Sitz. K. Akad. Wissensch. Wien, LXVII, 1. Abth., p. 36, 1873.

<*Scombresocidæ*, POEY, Anal. Soc. Esp. Hist. Nat., IV, p. 9, 1875.

<*Scomberesocidæ*, JORDAN and GILBERT, Syn. Fishes N. America, pp. 75, 371, 1882.

Diagnosis.—Synentognathi with the supramaxillaries only in contact with the intermaxillaries, the mandible with a reduced intradentary bone, the hypopharyngeals united in a broad triangular body, the third pair of epipharyngeals much enlarged, those of the fourth pair aborted or united with the third, and the vertebræ without zygapophysoid processes.

Subfamily SCOMBERESOCINÆ.

=*Scomberesocinæ*, GILL, Cat. Fishes E. Coast N. America, p. 38, 1861.
=*Scomberesocinæ*, JORDAN and GILBERT, Syn. Fishes N. A., p. 372, 1882.
Sphyrenidia genus, RAFINESQUE, 1815.

Diagnosis.—Exocœtids with both jaws more or less elongated and attenuated forward, pectoral fins moderate, and the epipharyngeals of the third pair separate from each other.

Two genera are known.

Genus SCOMBERESOX.

Scomberesox, LACÉPÈDE, Hist. Nat. des Poissons, V, p. 344, 1803.
Sayris, RAFINESQUE, Car. Alc. Gen. e Sp., p. 60, 1810; Anal. Nat., p. 89, 1815.
Les Scombrésoces, CUVIER, Règne Animal (1re éd.), II, p. 186, 1817.
Scomberesox, CUVIER and VALENCIENNES, Hist. Nat. des Poissons, XVIII, p. 460, 1846.
Grammiconotus, COSTA, Ann. Mus. Zool. Napoli, 1862, p. 55.
Scombresox, GÜNTHER, Cat. Fish. Brit. Mus., VI, p. 256, 1866.

From this genus should be removed the *S. brevirostris* of California, which is distinguished by the short or curtailed forceps-like jaws.

Genus COLOLABIS.

Cololabis, GILL, MSS.
Scombresox, sp., PETERS et al.

Type *C. brevirostris*.

Subfamily EXOCŒTINÆ.

< *Lepomia*, RAFINESQUE, Analyse Nat., p. 88, 1815.
= *Exocœtini*, BONAPARTE, Giorn. Accad. di Scienze, LII (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo), p. 94, 1832.
< *Exocetinæ*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, p. 296, 1839.
= *Exocœtini*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 133, 1838; IV, p. 274, 1840.
= *Exocœtini*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. 30, 1859.
= *Exocœtiformes*, BLEEKER, Atlas Ich. Indes Néerland., VI, p. 67, 1866–72.
= *Exocœtinæ*, JORDAN and GILBERT, Syn. Fishes N. Am., p. 372, 1882.

Diagnosis.—Exocœtids with both jaws rounded or simply angulated forward, pectoral fins enlarged and adapted for sustentation of the body in the air, and the epipharyngeals of the third pair separate.

Genus EXOCŒTUS.

Exocœtus, LINNÆUS, Syst. Nat., 10th ed., I, p. 316, 1758 (*E. volitans*, only sp.).
Exocœtus, WEINLAND, Proc. Boston Soc. Nat. Hist., VI, p. 385, 1859.
Cypselurus, SWAINSON, Nat. Hist. Fishes, etc., II, p. 296, 1839.
Ptenichthys, MÜLLER, Archiv Naturgesch., 9. Jahrg., I, p. 312, 1843.

Genus HALOCYPSELUS.

Halocypselus, WEINLAND, Proc. Boston Soc. Nat. Hist., VI, p. 385, 1859 (*mesogaster*).

Genus PAREXOCŒTUS.

Parexocœtus, BLEEKER, Nederl. Tydschr. Dierk., III, p. 105, 1865.

Genus FODIATOR.

Fodiator, JORDAN and MEEK, Proc. U. S. Nat. Mus., VIII, p. 15, 1885.

Subfamily HEMIRHAMPHINÆ.

= *Hemirhamphinæ*, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 118 (1859).
= *Hemirhamphina*, POEY, Anal. de la Soc. Esp. de Hist. Nat., IV, p. 38, 1875.
= *Hemirhamphinæ*, GILL, Cat. Fishes E. Coast N. America, VI, p. 38, 1872.
= *Hemirhamphiformes*, BLEEKER, Atlas Ich. Indes Nécrland., VI, p. 51, 1866–72.
= *Hemirhamphinæ*, JORDAN and GILBERT, Syn. Fishes N. Am., p. 372, 1882

Diagnosis.—Exocœtids with the upper jaw angulate and the lower produced into an elongated beak, pectoral fins moderate or little enlarged, and the epipharyngeals of the third pair closely united in a transverse plate.

Genus EULEPTORHAMPHUS.

Euleptorhamphus, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 156 (1859).

Genus OXYPORHAMPHUS.

Oxyporhamphus, GILL, Proc. Acad. Nat. Sci. Phila. 1863, p. 273 (1863).

Genus ZENARCHOPTERUS.

Zenarchopterus, GILL, Proc. Acad. Nat. Sci. Phila. 1863, p. 273 (1863).

Genus CHRIODORUS.

Chriodorus, GOODE and BEAN, Proc. U. S. Nat. Mus., V, p. 432 (1882).

Genus DERMOGENYS.

Dermogenys, VAN HASSELT Algem. Konsten Letterb., 1823, No. 35, p. 131 (fide Bleeker).
Dermogenys, (VAN HASSELT) BLEEKER, Ned. Tydschr. Dierk., III, p. 165, 1865.
Dermatogenys, GÜNTHER, Cat. Fish. Brit. Mus., VI, pp. 260, 275, 1866. (Subgenus.)
Hemirhamphus, sp., GÜNTHER.

Genus HEMIRHAMPHODON.

Hemirhamphodon, BLEEKER, Ned. Tydschr. Dierk., III, p. 139, 1865.
Hemirhamphus, sp., GÜNTHER.

Genus ARRHAMPHUS.

Arrhamphus, GÜNTHER, Cat. Fish. Brit. Mus., VI, pp. 233, 277, 1866.
Oxyporhamphus, sp., BLEEKER.

Genus HEMIRAMPHUS.

Hemiramphus, CUVIER, Regne Animal, II, p. 371, 1817.

Genus HYPORHAMPHUS.

Hyporhamphus, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 131 (1859).

Family ESOCIDÆ.

<*Siagonotes*, DUMÉRIL, Zool. Anal., p. 119, 1806.
<*Esocidi*, RAFINESQUE, Indice d'Ittiolog. Siciliana, p. 31, 1810.
<*Siagoia*, RAFINESQUE, Analyse de la Nature, 23. fam., p. 89, 1815.

<*Esoces*, CUVIER, Règne Animal, 1e éd., II, p. 182, 1817; 2e éd., II, p. 281, 1829.
<*Esocidæ*, FLEMING, Phil. Zool., p. 385, 1822.
<*Esociens, Esocii*, LATREILLE, Fam. Nat. Règne An., p. 121, 1825.
<*Exoceides*, RISSO, Hist. Nat. Europe Mérid., III, 1826.
<*Esocidæ*, BONAPARTE, Giorn. Accad. di Scienze, LII (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo), p. 94, 1832.
<*Esocida*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 133, 1838; IV, p. 273, 1840.
<*Salmonidæ*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 184, 283, 1839.
<*Brochets ou Lucioïdes*, VALENCIENNES, Hist. Nat. Poiss., XVIII, 1846.
<*Belonidæ*, BONAPARTE, Consp. Syst. Ich., fam. 68, 1850.
=*Belonidæ*, GILL, Arrang Fam. Fishes, p. 14, 1872.
=*Belonidæ*, COPE, Proc. Am. Phil. Soc., XVII, p. 695, 1878.
=*Belonidæ*, JORDAN and FORDYCE, Proc. U. S. Nat. Mus., IX, 1886, p. 339.

Diagnosis.—Synentognathi with the supramaxillaries united by suture with the intermaxillaries, the mandible with an elongated intradentary bone, the hypopharyngeals united in a narrow body, the third pair of epipharyngeals little enlarged, those of the fourth pair distinct from the third and from each other, and the vertebræ with distinct zygapophysoid processes.

Subfamily ESOCINÆ.

<*Esocidia*, RAFINESQUE, Analyse Nat., p. 89, 1815.
<*Belonini*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 133, 1838; IV, p. 274, 1840.
<*Belonoidei*, BLEEKER, Enum. Sp. Piscium Archipel. Indico. p. xxx, 1859.
=*Belonina*, GILL, Cat. Fishes E. Coast N. America, p. 38, 1861.
=*Belonini*, POEY, Anal. de la Soc. Esp. de Hist. Nat., IV, p. 9, 1875.
=*Mastacembeliformes*, BLEEKER, Atlas Ich. Indes Néerland., VI, p. 43, 1866–72.
=*Belonina*, JORDAN and GILBERT, Syn. Fishes N. America, p. 372, 1882.

Genus ESOX.

Mastacembelus. KLEIN, Hist. Pisc. Nat., IV, p. 21, 1744.
Esox, LINNÆUS, Syst. Nat., ed. 10, I, p. 313, 1758.
Esox, RAFINESQUE, Car. alc. Gen. e Sp., p. 59, 1810.
Raphistoma, RAFINESQUE, Anal. Nat., p. 89, 1815.
Belone, CUVIER, Règne Animal, II, p. 185, 1817.
Ramphistoma (RAFINESQUE) SWAINSON, Nat. Hist. Fishes, etc., II, p. 296, 1839.
Macrognathus, GRONOW, p. 147, 1854.
Mastacembelus, BLEEKER, Nederl. Tijdskr. Dierk., III, p. 214, 1866.

Genus TYLOSURUS.

Tylosurus, COCCO, Giorn. Sc. Lett. e Arte Sicil., "XVII, p. 18, 1829".
Tylosurus, JORDAN and GILBERT, Syn. Fishes N. Am., p. 372, 1883.

Genus ATHLENNES.

Athlennes, JORDAN and MEEK, Proc. U. S. Nat. Mus., IX, p. 343 (subgenus), 1886.
Athlennes, JORDAN, Man. Vert. An. N. U. S., 5th ed., p. 92 (genus), 1888.

Genus POTAMORRHAPHIS.

Potamorrhaphis, GÜNTHER, Cat. Fish. Brit. Mus., VI, pp. 234, 256 (subgenus), 1866.
Lymnobelus, AGASSIZ, Journey to Brazil, p. 237, 1868.